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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,295	11/03/2003	Michael E. Badding	SP03-079A	6519

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CORNING INCORPORATED

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EXAMINER

WALKER, KEITH D

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 10/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/700,295

Applicant(s)

BADDING ET AL.

Examiner

Keith Walker

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 13-28 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3 is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 4-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

Claims 1-28 are pending in the application and claims 13-28 are withdrawn for being drawn to non-elected claims. Claim 3 is allowed for reasons set forth below.

Claims 1, 2 & 4-12 are pending examination and are rejected for reasons below.

### ***Drawings***

The drawings received on 7/17/06 are accepted and entered.

### ***Terminal Disclaimer***

The terminal disclaimer filed on 7/28/06 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on application number 10/611,507 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 2 & 4-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2003/0165732 A1 (McElroy) and evidenced by *Fuel Cell Systems*.

Regarding claims 1, 2, 4-6 & 9 McElroy discloses a ceramic yttria stabilized zirconia electrolyte with at least one non-uniform surface, where the surface is textured

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with a plurality of protrusions having a height of 0.5 to 2.5 microns ([0187, 0189]). The components making up the electrolyte are mixed together forming a slurry and then applied to a Mylar film and spread using a doctor blade making a uniform electrolyte structure ([0207]). It is obvious to one skilled in the art that this process makes a homogeneous body and it is well known in the art that the electrolyte is non-porous (Evidenced by Fuel Cell Systems, Pg. 108, Sec. 3.6.2.3).

When using the electrolyte with one non-uniform surface, the orientation of the non-uniform surface towards which electrode is not discussed. Since only two choices exist, pointing the textured side to the anode or the cathode is seen as a rearrangement of parts, it would have been obvious to one having ordinary skill in the art at the time the invention was made to change the orientation of the electrolyte sheet to optimize the performance of the fuel cell, since it has been held that rearranging parts of an invention involves only routine skill in the art (*MPEP 2144.04*). As pointed out in applicant's specification ([0104]), it is known to have a higher flow of air across the cathode, creating greater compressive force on the high-pressure side (airside) and a greater tensile force on the fuel side. So it is inherent that the fuel cell, taught by McElroy, has a predominately compressive force on the airside and tensile force on the fuel side. The electrolyte thickness is disclosed as being 50 – 250 microns thick ([0187]). While McElroy is silent to an electrolyte thickness of less than 45 microns, claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art (*In re Woodruff*, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

Claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result, which is different in kind and not merely in degree from the results of the prior art (MPEP 2144.08).

2. Claims 1, 2 & 4-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2003/0165732 A1 (McElroy) in view of US Publication 2002/0012825 (Sasahara) and evidenced by *Fuel Cell Systems*.

The disclosure of McElroy and *Fuel Cell Systems* as discussed above are incorporated herein.

McElroy is silent as to which electrode of the fuel cell the textured surface is facing.

Sasahara teaches a solid oxide electrolyte with three-dimensional features on one face of the electrolyte (Abstract; Figs. 3 A, B; [0038, 0043]). The three-dimensional features (textured surface) have a depth range of 5 – 500 microns and face toward the cathode side (Figs. 13 A, B; [0019, 0062]). The textured surface provides for a high reaction surface area-to-volume ratio, thereby increasing the volumetric power density. Furthermore, the structural rigidity is improved allowing for a significant decrease in device size ([0014, 0018]).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the electrolyte of McElroy with the textured surface of Sasahara to improve the structural rigidity and the volumetric power density.

3. Claims 8, 9 & 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2003/0165732 A1 (McElroy) in view of US Publication 2001/0044043 (Badding) and evidenced by *Fuel Cell Systems*.

The disclosure of McElroy and *Fuel Cell Systems* as discussed above are incorporated herein.

McElroy doesn't teach the electrolyte thickness being below 45 microns and is silent to the electrolyte being non-porous.

Badding teaches the use of a flexible ceramic electrolyte with the thickness in the range of 5-20 microns ([0042]). The electrolyte is described as a dense material ([0003]), while the electrodes are described as a porous material. By describing the electrode as being porous and the electrolyte as dense, one of ordinary skill in the art would infer this to be a substantially non-porous body. The dense (non-porous) electrolyte material prevents reactant crossover and the electrolyte thickness enhances the thermal shock resistance and electrochemical performance (4:1-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of McElroy with the electrolyte thickness as taught by Bedding, since it would have enhanced the thermal shock resistance and electrochemical performance.

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4. Claims 1, 2 & 4-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2003/0165732 A1 (McElroy) in view of JP Publication 05-258756 (Kato) and evidenced by *Fuel Cell Systems*.

The disclosure of McElroy and *Fuel Cell Systems* as discussed above are incorporated herein.

McElroy is silent as to which electrode of the fuel cell the textured surface is facing.

Kato teaches texturing the oxidant surface of a fuel cell electrolyte (Abstract, 0022, 0023, 0026]). The texturing allows the expansion of the reaction surfaces between the cathode and the electrolyte, thereby improving the electrochemical reaction of the fuel cell. While the electrolyte between the two references is different, the teaching of texturing the surface of an electrolyte to produce more reactive surface area between the electrode and electrolyte is transferable between the electrolyte types.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify textured electrolyte of McElroy with the teachings of Kato, to arrange the textured surface toward the cathode and produce a larger reactive area for the oxygen reduction reaction.

#### ***Allowable Subject Matter***

Claim 3 is allowed. The prior art of record does not teach an electrolyte layer having a thicker and thinner areas and the thinner areas become progressively thinner closer to the edges.

### ***Response to Arguments***

Applicant's arguments filed 7/17/06 have been fully considered but they are not persuasive.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues the prior art does not teach a homogeneously non-porous electrolyte. As discussed above, the Fuel Cell Systems book teaches the electrolyte needs to be non-porous. Furthermore, it is well known in the art to have a solid oxide electrolyte non-porous to prevent reactant crossover. McElroy discloses mixing all the elements of the electrolyte together before casting the slurry onto a substrate to form a uniform electrolyte, therefore since it has not been otherwise noted, it would be obvious to one skilled in the art that the electrolyte slurry is a homogeneous mixture.

Applicant argues no reason to change the facing direction of the textured surface of McElroy to optimize the fuel cell. Since the reference is silent as to which electrode the textured surface faces and only two possible directions are possible, the anode or the cathode, it would not be beyond one skilled in the art to run the fuel cell



twice, once for each possibility to find which direction optimizes the performance of the fuel cell. As for the lack of teaching of the two forces by the prior art, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Applicant argues the Kato reference is directed to a different technology and therefore not combinable with the McElroy reference. While the electrolytes are different and taking the polymer electrolyte membrane material of Kato and putting it in the solid oxide fuel cell of McElroy would incinerate the membrane, the teaching by Kato to increase the reactant surface area between the cathode and electrolyte is transferable between fuel cells. Furthermore, the prior art of US Publication 2002/0012825 (Sasahara) teaches electrolytic patterns for both polymer electrolyte material and solid oxide material ([0038, 0050]). Therefore one skilled in the art would look to other fuel cell types for various teachings to improve the performance of a fuel cell.

Applicant argues paragraph [0104] of the instant application does not disclose prior art. It is the Examiner's position that the manner in which the fuel cell is operated is disclosed as prior art and not only as the examples of applicant's instant application.

Applicant's arguments with respect to claims 1, 2 & 4-12 have been considered but are moot in view of the new ground(s) of rejection.

### **Conclusion**

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keith Walker whose telephone number is 571-272-3458. The examiner can normally be reached on Mon. - Fri. 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Trainer Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

K. Walker



**SUSY TSANG-FOSTER**  
**PRIMARY EXAMINER**